4. $\dfrac{\partial w}{\partial t} = \dfrac{\partial}{\partial x}\left[f(w)\left(\dfrac{\partial w}{\partial x}\right)^n\right] + g(w).$

This equation governs unsteady heat conduction in a quiescent medium in the case where the thermal diffusivity and the rate of reaction are arbitrary functions of temperature.

1°. Let the function $f = f(w)$ be arbitrary and let $g = g(w)$ be defined by

$$g(w) = A[f(w)]^{-1/n} - B,$$

where A and B are some numbers. In this case, there is a functional separable solution, which is defined implicitly by

$$\int [f(w)]^{1/n}\,dw = At + \frac{n}{B(n+1)}(Bx + C_1)^{\frac{n+1}{n}} + C_2,$$

where C_1 and C_2 are arbitrary constants.

⊙ *Reference*: A. D. Polyanin, *EqWorld*, 2004 (Private communication, received 22 March 2004).

2°. Let $g = g(w)$ be arbitrary and let $f = f(w)$ be defined by

$$f(w) = \frac{A_1 A_2^n\, w + B}{[g(w)]^n} + \frac{A_2^n A_3}{[g(w)]^n}\int Z\,dw, \qquad (1)$$

$$Z = A_2\int \frac{dw}{g(w)}, \qquad (2)$$

where A_1, A_2, and A_3 are some numbers. In this case, there are generalized traveling-wave solutions of the form

$$w = w(Z), \qquad Z = \varphi(t)x + \psi(t),$$

where the function $w(Z)$ is determined by the inversion of (2),

$$\varphi(t) = \left[\frac{1}{C_1 - A_3(n+1)t}\right]^{\frac{1}{n+1}},$$

$$\psi(t) = \varphi(t)\left[A_1\int [\varphi(t)]^n\,dt + A_2\int \frac{dt}{\varphi(t)} + C_2\right],$$

and C_1 and C_2 are arbitrary constants.

⊙ *Reference*: E. A. Vyazmina, *EqWorld*, 2004 (Private communication, received 25 March 2004).

3°. Let now $g = g(w)$ be arbitrary and let $f = f(w)$ be defined by

$$f(w) = \frac{1}{[(g(w)]^n}\left(A_1 w + A_3\int Z\,dw\right)\exp\left[nA_4\int \frac{dw}{g(w)}\right], \qquad (3)$$

$$Z = \frac{1}{A_4}\exp\left[A_4\int \frac{dw}{g(w)}\right] - \frac{A_2}{A_4}, \qquad (4)$$

where A_1, A_2, A_3, and A_4 are some numbers ($A_4 \neq 0$). In this case, there are generalized traveling-wave solutions of the form

$$w = w(Z), \qquad Z = \varphi(t)x + \psi(t),$$

where the function $w(Z)$ is determined by the inversion of (4),

$$\varphi(t) = \left[C_1 e^{-(n+1)A_4 t} - \frac{A_3}{A_4}\right]^{-\frac{1}{n+1}},$$

$$\psi(t) = \varphi(t)\left[A_1\int [\varphi(t)]^n\,dt + A_2\int \frac{dt}{\varphi(t)} + C_2\right],$$

and C_1 and C_2 are arbitrary constants.

⊙ *Reference*: E. A. Vyazmina, *EqWorld*, 2004 (Private communication, received 25 March 2004).

4°. Equations admitting functional separable solutions of the form

$$w = F(\xi), \qquad \xi = \varphi(x) + \psi(t)$$

were treated in the paper cited below.

⊙ *Reference*: Estévez, P. G., Qu, C. Z., and Zhang, S. L., *J. Math. Anal. Appl.*, Vol. 275, pp. 44–59, 2002.

